GUEST EDITORIAL

Chronic stress as a catalyst for non-communicable diseases

Asha K. Pratinidhi
Ex-Editor-in-chief, Journal of Krishna Institute of Medical Sciences University,
Ex-Director Research, Directorate of Research, Krishna Vishwa Vidyapeeth
(Deemed to be University), Malkapur, Karad-415539 (Maharashtra) India

The World Health Organization (WHO) defines stress as a state of worry or mental tension caused by a difficult situation. It is a natural human response that prompts individuals to address challenges and threats in their lives, with its impact on well-being largely depending on how one responds to it [1].

Stress is the body and mind's natural, automatic response to any demand, threat, or pressure-known as a stressor [1]. It causes physical and mental tension, triggering chemical changes like increased heart rate and adrenaline [2]. While short-term stress can boost performance (eustress) [3], chronic, long-term stress can severely harm physical and mental health [4].

Stress means a mental tension caused by a situation that is difficult, dangerous, worrying, frightening, frustrating, confusing, and makes one feel worthless [1]. Stress is one of the most important modifiable risk factors for causation of chronic Non-Communicable Diseases (NCDs) like myocardial infarction, stroke, atherosclerosis, hypertension, diabetes mellitus, obesity, metabolic syndrome, chronic kidney disease, and various psychiatric and mental ailments [5]. According to the WHO, NCDs kill at least 43 million people annually, equivalent to 74% of all deaths globally [6]. Often stress is not identified and mentioned as a cause of death in NCDs, though it is an important contributing factor triggering the pathophysiological changes in a person experiencing chronic stress for a prolonged period, ultimately accelerating these disease conditions and death.

Acute stress activates the sympathetic adrenomedullary system often cited typically by Walter Bradford Cannon (1915) as the 'fight and flight response' [7]. Chronic stress on the other hand is predominantly mediated through sustained activation of the Hypothalamic–Pituitary–Adrenal (HPA) axis [4]. This neuroendocrine system serves as the principal interface between central neural processing of stress and peripheral glucocorticoid secretion [5]. Corticotropin-releasing hormone released from the hypothalamus stimulates adrenocorticotropic hormone secretion from the anterior pituitary, which in turn promotes cortisol synthesis in the adrenal cortex [8]. This critical neurohumoral link was identified by researchers like Geoffrey Harris in 1950 [9].

During prehistoric times humans dealt with brief periods of acute stress, contrary to the modern period, where human experience chronic stress of a psychosocial nature [10]. Early stress responses were acute and self-limiting, resolving once the physical threat subsided [4]. In contrast to those, occupational demands, socioeconomic pressures, and constant cognitive rumination result in chronic stress. Stress is related mainly to socioeconomic pressures, conflicts at work and at home, major life changes, loss of near and dear ones, illness in the family. To these conventional causes are added modern environmental causes related to urbanization and population explosion. The traditional and conventional social support systems are disrupted due to changing family composition like breaking up of joint family, changing concepts of marriage,

live in relationships and break ups. Such situations resulting in low grade constant activation of HPA axis [5] and elevated adrenergic hormonal levels which adversely affect every organ of the body.

Screening and diagnostic tests for various NCDs are based on objective criteria that are sensitive, specific, affordable, acceptable, and reliable, allowing them to be performed rapidly and easily [11]. In contrast, the diagnosis of stress remains a predominantly clinical process based on subjective assessments of symptoms and face-to-face medical interviews to evaluate physical and psychological indicators. Current assessment tools, including medical history, reviews and questionnaires, are often viewed as tedious, non-specific, and time-consuming [12]. Furthermore, laboratory tests measuring cortisol levels in blood, saliva, urine, and hair, do face significant limitations; there is no single universally accepted marker, and results are frequently confounded by diurnal fluctuations or external factors such as infection and medication [13].

Except during natural or man-made disasters, acute stress is relatively infrequent, whereas chronic low-grade stress has become an inevitable part of modern life. Physiological changes namely elevated blood pressure, sustained activation of the sympathetic nervous system, proinflammatory response, and metabolic syndrome occur as a result [5,14]. The contribution of stress in the causation of diseases is often not recognized due to its gradual onset and the complexity of modern lifestyle variables. Often, individuals under stress do not recognize it themselves, and the physicians frequently fail to diagnose the condition due to a lack of well-defined, objective criteria. Whether diagnosed or undiagnosed, existing chronic stress adversely affects the body stealthily by altering pathophysiology by persistent activation of HPA axis, as emotional part of the brain responds and reacts to stress.

Evolutionarily the primitive brain is responsible for survival instincts like hunger, self-defence and propagation of species. It is present across all animal species [15]. As complexity increased, the emotional and intellectual brain structures emerged in higher animals. In humans, this evolution culminated in a highly developed prefrontal cortex, often associated with a 'spiritual' or moral consciousness [16]. The emotional centre (hypothalamus), along with the nervous, endocrine, and immune systems, forms a continuous psychosomatic network. This mind-body communication is mediated by approximately 60 to 70 distinct neuropeptides [17]. These peptides act as biochemical markers, translating complex emotions —such as fear, joy, and anger—into physiological signals felt throughout the entire network.

It is not possible to have completely stress-free life but we can reduce the stress and learn to manage it [3]. Stress often arises from the heavy burden of responsibility we carry for ourselves, our families, and the world at large. Due to competition, we feel that 'he has it, why not me?' This mindset can drive people to pursue money, power and material comforts by any means [17]. We strive to get all worldly comforts and yet remain dissatisfied [18]. It's a mirage, an illusion... therefore it is important to recognise chronic stress in timely manner and avoid its long- term adverse effects. Along with regular yearly medical check-ups and preventive health practices, it is important to focus on a balanced diet, regular exercise, maintenance of healthy weight and adequate sleep. Relaxation and mindful techniques such as chanting, yoga, meditation, pursuing sports and hobbies can be very helpful [19]. One should seek counselling for stress relief, if it is uncontrolled. Along with the stress relief measures, if we can develop an attitude of little detachment from the worldly desires maybe we can beat the stress of life! [20].

Bhagavan Shree Krishna advises Arjuna
(Bhagwat Gita 2.71)
विहाय कामान्यः सर्वान्पुमांश्चरति निःस्पृहः।
निर्ममो निरहंकारः स शान्तिमधिगच्छति॥

Meaning: "A person who has given up all desires for sense gratification, who lives free from desires, who has given up all sense of proprietorship (mine-ness), and is devoid of false ego—he alone can attain real peace!"

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***Author for Correspondence:**

Dr. Asha K. Pratinidhi, Ex-Editor-in-chief, Journal of Krishna Institute of Medical Sciences University, Ex-Director Research, Directorate of Research, Krishna Vishwa Vidyapeeth (Deemed to be University), Malkapur, Karad-415539, Maharashtra, India

Email: ashapratinidhi@gmail.com Cell: 8888908099

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